



Correspondence

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RE: Preliminary Evaluation of PCB Congener and PCB Aroclor Data
Cornell-Dubilier Electronics Superfund Site: OU4 Bound Brook
W912DQ-08-D-0017, Task Order 0001

On behalf of the United States Army Corps of Engineers (USACE) and United States Environmental Protection Agency (EPA), The Louis Berger Group, Inc. (Berger) and ARCADIS/Malcolm Pirnie, Inc. are conducting a remedial investigation (RI) / feasibility study (FS) at the Cornell-Dubilier Electronics (CDE) Superfund Site (Middlesex County, New Jersey). The purpose of this memo is to evaluate differences in reported concentrations of polychlorinated biphenyls (PCB) in sediment samples analyzed by EPA Contract Laboratory Program (CLP) and Berger subcontract laboratories during the RI for Operable Unit 4 (OU4) of the CDE site, which consists of Bound Brook (a freshwater stream flowing past the former CDE facility). In summary, the PCB congener analyses conducted by Axys Analytical Services, Ltd. (Axys Analytical) indicate that the total PCB concentration in the sediments may be up to 2.7 times higher than the Aroclor 1254 concentration reported by the CLP laboratories. Further details regarding this conclusion are provided below.

In October 2011, EPA requested that Berger conduct a preliminary review of sediment chemistry data collected during the 2011 RI field program to identify areas of the brook that were contaminated with a total PCB concentration above a preliminary criterion of 5 parts per million [ppm; or milligrams per kilogram (mg/kg)]. PCB compounds can be analyzed and reported by a laboratory in different forms including congener, Aroclor mixture, and homolog group concentrations. For the OU4 RI, the following analyses were conducted:

- For samples collected to characterize sediment contaminant fate and transport, Axys Analytical was subcontracted to conduct Method 1668A for the analysis of the 209 individual PCB congeners, in which total PCB is reported as the sum of detected congeners (nondetected PCB congeners are incorporated into the summation as zero).

- For samples collected to characterize the horizontal and vertical extent of contamination, CLP laboratories performed CLP Method SOMO1.2 to report PCB Aroclor mixture concentrations.

Historically, PCB compounds were manufactured as mixtures, also known as "Aroclors." Different Aroclor mixtures consisted of different proportions of PCB congeners. There are several analytical and data evaluation methods for determining PCB Aroclor concentrations, including measuring the individual PCB congeners in a sample and then calculating the PCB Aroclor mixture concentration using a formula, or by reviewing a PCB chromatogram, identifying a match in an Aroclor 'fingerprint' pattern, and reporting the Aroclor concentration based on certain chromatographic peak heights. The latter method was used by the CLP laboratories for OU4 samples.

CLP laboratories that analyzed the Bound Brook samples included Shealy Environmental Services, Liberty Analytical, and Test America. During the preliminary evaluation of contaminated sediment areas requested by EPA, Berger reviewed approximately 200 sediment sample results that were obtained through CLP for analysis of nine PCB Aroclor mixtures.¹ The reported PCB Aroclor data revealed that Aroclor 1254 was the predominant Aroclor mixture detected in Bound Brook. The remaining Aroclor mixtures were reported as nondetected by CLP.² A nondetected PCB Aroclor result does not guarantee that PCB compounds are not present in the sample; in fact, they may actually be present but the laboratory may not have been able to reliably identify and quantify the mixture from the PCB chromatogram. (This difficulty, if encountered, could be due to weathering and degradation of the lower molecular weight PCB compounds in the environment, which impacts the fingerprint pattern expected to be observed in a chromatogram.)

As a check on the nondetect PCB Aroclor results reported by CLP, Berger conducted a preliminary review of the data from the sediment samples that were analyzed by Axys for PCB congeners. Axys Analytical reported the PCB congener data as individual congeners and as homologues (separate summations of the mono-chlorinated congeners, di-chlorinated congeners, tri-chlorinated congeners, etc.). Using these results, Berger calculated the expected Aroclor 1254 mixture concentration in the sediment samples analyzed by Axys Analytical, knowing that the Aroclor 1254 mixture consists of the following homolog groups (Frame *et al.*, 1996)³:

- 0.02 percent mono-chlorinated PCB homologues
- 0.09 percent di-chlorinated PCB homologues
- 0.39 percent tri-chlorinated PCB homologues
- 4.86 percent tetra-chlorinated PCB homologues
- 71.44 percent penta-chlorinated PCB homologues
- 21.97 percent hexa-chlorinated PCB homologues

¹ The CLP Scope of Work includes Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, and Aroclor 1268.

² Of the 200 samples preliminarily examined, Aroclor 1242 was detected in 11 samples and Aroclor 1260 was detected in 32 samples. All other Aroclor mixtures were reported as not detected by CLP.

³ Reference: Frame G M, Cochran J W, and Boewadt SS. 1996. J. High Res. Chromatogr., Vol. 19, pp 657-668.

- 1.36 percent hepta-chlorinated PCB homologues
- 0 percent octa-chlorinated PCB homologues
- 0.04 percent nona-chlorinated PCB homologues

If the CLP results were representative of the sediment contamination, the calculated concentrations of Aroclor 1254 from the Axys results should have been equal or at least close to the total concentration of PCB congeners detected in the samples. Instead, the results of Berger's calculation indicated that the concentration of Aroclor 1254 estimated from the Axys Analytical congener data was approximately 37 percent of the total PCB (sum of all detected congeners) detected in the samples analyzed by Axys Analytical. This estimation suggests that the CLP sample results, which generally detected only Aroclor 1254, may only be identifying and quantifying only 37 percent of the total PCB present in the sediment samples analyzed by CLP. Berger will continue to evaluate this potential disparity in PCB results during the RI process.

If you have any questions regarding this information, please contact AmyMarie Accardi-Dey at (914) 798-3712 or Len Warner at (914) 798-3721.

